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National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

Dec 76

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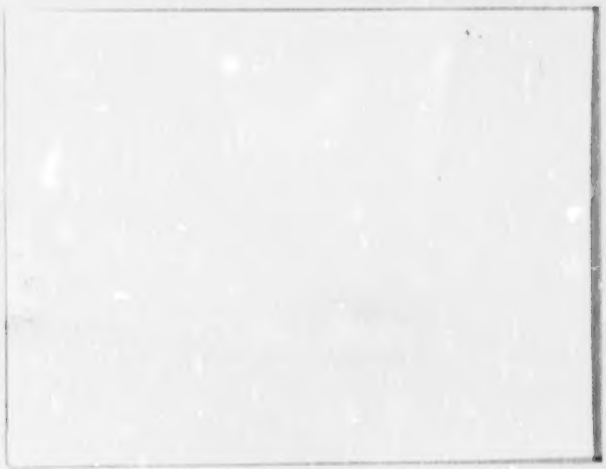
U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES



CORVALLIS ENVIRONMENTAL RESEARCH LABORATORY - CORVALLIS, OREGON

and

ENVIRONMENTAL MONITORING & SUPPORT LABORATORY - LAS VEGAS, NEVADA

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REPORT

ON

NORTH WAUBAY LAKE

DAY COUNTY

SOUTH DAKOTA

EPA REGION VIII

WORKING PAPER No. 628

WITH THE COOPERATION OF THE

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENTAL PROTECTION

AND THE

SOUTH DAKOTA NATIONAL GUARD

DECEMBER, 1976

1a

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the South Dakota Departments of Environmental Protection and Game, Fish and Parks for professional involvement, to the South Dakota National Guard for conducting the tributary sampling phase of the Survey, and to those wastewater treatment plant operators who voluntarily provided effluent samples.

Allyn Lockner, Secretary, and Blaine Barker and Duane Murphy, Department of Environmental Quality; Douglas Hansen, Department of Game, Fish and Parks; and James Hayden, Director, State Lakes Preservation Committee provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

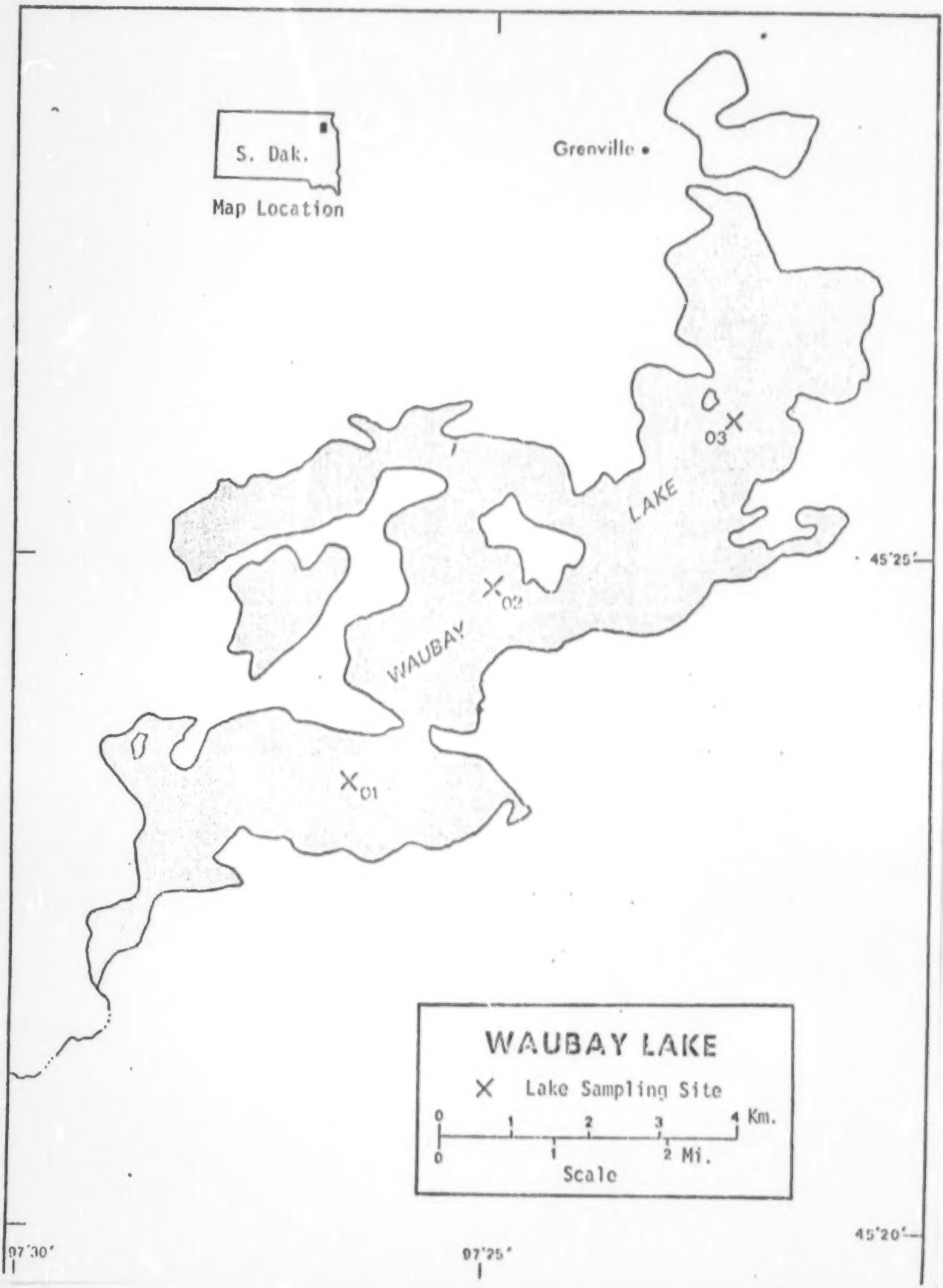
Major General Duane L. Corning, the Adjutant General of South Dakota, and Project Officer Colonel Robert D. Chalberg, who directed the volunteer efforts of the South Dakota National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF SOUTH DAKOTA

LAKE NAME	COUNTY
Albert	Kingsbury
Alvin	Lincoln
Angostura	Fall River
Brant	Lake
Byron	Beadle
Clear	Marshall
Clear	Minnehaha
Cochrane	Deuel
Cottonwood	Spink
Deerfield	Pennington
Enemy Swim	Day
Herman	Lake
John	Hamlin
Kampeska	Codington
Madison	Lake
Mitchell	Davidson
Norden	Hamlin
East Oakwood	Brookings
West Oakwood	Brookings
Pactola	Pennington
Pickerel	Day
Poinsett	Brookings, Lake
Red Iron South	Marshall
Richmond	Brown
Roy	Marshall
Sand	Brown
Sheridan	Pennington
Stockdale	Custer
East Vermillion	McCook
Wall	Minnehaha
Waubay	Day


S. Dak.
Map Location
Grenville
LAKE
WAUBAY
03
02
01
45°25'
45°20'
97°30'
97°25'
WAUBAY LAKE
Lake Sampling Site
0 1 2 3 4 Km.
0 1 2 Mi.
Scale

NORTH WAUBAY LAKE

STORET NO. 4631

I. INTRODUCTION

North Waubay Lake was included in the National Eutrophication Survey as a water body of interest to the South Dakota Departments of Environmental Protection and Game, Fish and Parks. Tributaries and nutrient sources were not sampled, and this report relates only to lake sampling data.

North Waubay Lake is located in an area of partly wooded grasslands utilized mostly for pasture. The lake is adjacent to the Waubay National Wildlife Refuge and provides waterfowl habitat. Recurring winterkill prevents establishment of a significant sport fishery.

II. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that North Waubay Lake is eutrophic. It ranked twenty-first in overall trophic quality when the 31 South Dakota lakes sampled in 1974 were compared using a combination of six parameters*. Eleven of the lakes had less median total phosphorus, 15 had less median dissolved phosphorus, 16 had less median inorganic nitrogen, 27 had less mean chlorophyll a, and 19 had greater mean Secchi disc transparency.

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* See Appendix A.

Survey limnologists noted that the general appearance of the lake was poor. Submergent and emergent vegetation occupied about 40% of the littoral area, and algae blooms were in progress during the July and September sampling visits. Marked depression of dissolved oxygen (about 45% of saturation) occurred at sampling station 1 in July.

B. Rate-Limiting Nutrient:

A significant loss of nutrients in the assay sample occurred between the time of collection and the beginning of the assay, and the results are not indicative of conditions in the lake when the sample was taken (09/19/74).

The lake data indicate nitrogen limitation in April, July, and September.

III. LAKE AND DRAINAGE BASIC CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 14.15 kilometers^2.
2. Mean depth: 2.7 meters.
3. Maximum depth: 4.6 meters.
4. Volume: 38.232 x 10^6 m^3.

B. Precipitation*:

1. Year of sampling: 31.3 centimeters.
2. Mean annual: 51.1 centimeters.

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† Table of metric equivalents--Appendix B.
†† Murphy, 1974.
* See Working Paper No. 175 "...Survey Methods, 1973-1976".

IV. LAKE WATER QUALITY SUMMARY

North Waubay Lake was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from two or more depths at each station (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the September visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 1.8 meters at station 1 and 1.5 meters at stations 2 and 3.

The sampling results are presented in full in Appendix C and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR WAUBAY LAKE NORTH
STORET CODE 4631

PARAMETER	1ST SAMPLING (4/25/74) 3 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (7/11/74) 3 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (9/19/74) 3 SITES RANGE	MEAN	MEDIAN
TEMP (C)	8.2 - 10.6	9.9	10.1	24.7 - 25.2	24.9	24.8	15.1 - 15.8	15.4	15.2
DISS OXY (MG/L)	8.6 - 10.4	9.5	9.6	3.6 - 7.6	6.0	6.7	8.4 - 9.2	8.9	9.0
CNDCTVY (MCROMO)	2096. - 4310.	3294.	3451.	3454. - 7175.	5965.	7134.	3003. - 5757.	4781.	5585.
PH (STAND UNITS)	****** -**********			8.9 - 9.2	9.0	9.0	8.8 - 8.8	8.8	8.8
TOT ALK (MG/L)	128. - 374.	277.	308.	364. - 570.	445.	418.	580. - 950.	790.	850.
TOT P (MG/L)	0.053 - 0.156	0.096	0.086	0.101 - 0.363	0.187	0.121	0.069 - 0.158	0.094	0.084
ORTHO P (MG/L)	0.010 - 0.045	0.019	0.016	0.029 - 0.071	0.041	0.035	0.014 - 0.048	0.024	0.022
NO2+NO3 (MG/L)	0.070 - 0.120	0.088	0.080	0.070 - 0.210	0.115	0.095	0.020 - 0.030	0.025	0.025
AMMONIA (MG/L)	0.060 - 0.230	0.143	0.135	0.050 - 0.170	0.090	0.075	0.040 - 0.110	0.065	0.045
KJEL N (MG/L)	2.700 - 3.300	2.983	2.900	3.400 -12.400	6.317	3.950	3.300 - 4.300	3.800	3.700
INORG N (MG/L)	0.140 - 0.330	0.232	0.230	0.120 - 0.380	0.205	0.180	0.060 - 0.140	0.090	0.070
TOTAL N (MG/L)	2.770 - 3.400	3.072	3.000	3.480 -12.500	6.432	4.030	3.320 - 4.330	3.825	3.725
CHLRPYL A (UG/L)	1.4 - 30.1	11.8	3.9	67.8 - 900.4	348.8	78.3	6.2 - 42.1	20.5	13.1
SECCHI (METERS)	0.8 - 1.7	1.2	1.0	0.3 - 0.6	0.5	0.6	0.6 - 0.8	0.7	0.6

B. Biological characteristics:

1. Phytoplankton

Sampling Date	Dominant Genera	Algal Units per ml
04/25/74	1. Suriella sp.	291
	2. Cyclotella sp.	166
	3. Chroococcus sp.	125
	4. Microcystis sp.	83
	5. Amphiprora sp.	83
	Other genera	416
	Total	1,164
07/11/74	1. Aphanizomenon sp.	11,360
	2. Phormidium sp.	3,877
	3. Chaetoceros sp.	2,288
	4. Chroococcus sp.	1,435
	5. Chroomonas sp.	194
	Other genera	736
	Total	19,890
09/19/74	1. Gloeocystis (?) sp.	4,061
	2. Aphanizomenon sp.	1,684
	3. Nodularia sp.	74
	4. Chaetoceros sp.	50
	5. Nitzschia sp.	25
	Other genera	99
	Total	5,993

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
04/25/74	1	30.1
	2	3.9
	3	1.4
07/11/74	1	900.4
	2	67.8
	3	78.3
09/19/74	1	42.1
	2	13.1
	3	6.2

C. Limiting Nutrient Study:

A significant loss of nutrients occurred in the assay sample between the time of collection and the beginning of the assay, and the results are not indicative of conditions in the lake at the time the sample was taken (09/19/74).

The lake data indicate nitrogen limitation in April, July, and September (the mean inorganic nitrogen to orthophosphorus ratios were 12/1, 5/1, and 4/1, respectively).

V. LITERATURE REVIEWED

Murphy, Duane G, 1974. Personal communication (lake morphometry) SD Dept. of Env. Prot., Pierre.

Petri, Lester R, and L. Rodney Larson, 1966 (?). Quality of water in selected lakes of eastern South Dakota. Rept. of Inv. #1, SD Water Res. Comm., Pierre.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
4601	LAKE ALBERT	0.321	0.170	489.111	106.289	9.200	0.019
4602	ALVIN LAKE	0.067	0.970	442.833	4.700	9.400	0.017
4603	ANGOSTURA RESERVOIR	0.019	0.160	423.333	3.717	13.000	0.005
4604	BRANT LAKE	0.194	0.130	432.833	34.150	11.800	0.113
4605	LAKE BYRON	0.443	0.370	488.333	149.350	9.000	0.146
4606	CLEAR LAKE	0.027	0.075	430.167	11.983	8.800	0.009
4607	CLEAR LAKE	1.400	0.270	495.333	691.000	7.000	0.468
4608	COCHRANE LAKE	0.037	0.150	446.000	15.683	15.000	0.008
4609	COTTONWOOD LAKE	0.685	0.265	490.333	112.017	8.600	0.417
4610	DEERFIELD RESERVOIR	0.033	0.080	303.333	3.650	15.000	0.022
4611	ENEMY SWIM LAKE	0.037	0.085	442.600	14.200	8.200	0.013
4612	LAKE HERMAN	0.340	0.155	485.000	58.733	8.600	0.174
4613	ST JOHN LAKE	0.349	0.080	489.400	120.880	9.800	0.025
4614	LAKE KAMPESKA	0.220	0.105	468.889	20.567	8.200	0.128
4615	MADISON LAKE	0.250	0.090	445.555	22.578	14.000	0.107
4616	LAKE MITCHELL	0.099	0.085	465.833	14.883	13.800	0.015
4617	LAKE NORDEN	0.256	0.165	488.667	46.800	10.000	0.050
4618	OAKWOOD LAKE EAST	0.146	0.175	487.000	113.600	10.000	0.009
4619	OAKWOOD LAKE WEST	0.181	0.135	485.833	159.667	9.600	0.021
4620	PACTOLA RESERVOIR	0.011	0.070	248.444	1.478	11.000	0.006
4621	PICKEREL LAKE	0.049	0.095	439.833	15.833	9.600	0.009
4622	LAKE POINSETT	0.115	0.315	468.444	40.211	10.000	0.023
4623	LAKE RED IRON SOUTH	0.042	0.110	430.333	6.883	7.600	0.010
4624	RICHMOND LAKE	0.187	0.150	410.000	18.467	10.000	0.144
4625	ROY LAKE	0.034	0.070	431.000	13.333	11.000	0.010
4626	SAND LAKE	0.489	0.110	471.800	65.790	12.800	0.288
4627	SHERIDAN LAKE	0.053	0.105	394.000	15.433	15.000	0.016
4628	STOCKADE LAKE	0.233	0.150	432.000	25.400	15.000	0.109

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	25- MIN DO	MEDIAN DISS ORTHO P
4629	LAKE VERMILLION	0.211	0.100	472.833	100.800	9.200	0.092
4630	WALL LAKE	0.194	0.160	441.667	55.267	7.400	0.076
4631	WAUBAY LAKE NORTH	0.098	0.145	469.555	127.033	11.400	0.023

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
4601	LAKE ALBERT	20 (6)	20 (6)	10 (3)	23 (7)	68 (20)	60 (18)	201
4602	ALVIN LAKE	67 (20)	0 (0)	57 (17)	90 (27)	63 (19)	63 (19)	340
4603	ANGOSTURA RESERVOIR	97 (29)	30 (9)	87 (26)	93 (28)	20 (6)	100 (30)	427
4604	BRANT LAKE	40 (12)	53 (16)	70 (21)	47 (14)	27 (8)	23 (7)	260
4605	LAKE BYRON	10 (3)	3 (1)	17 (5)	7 (2)	73 (22)	13 (4)	123
4606	CLEAR LAKE	93 (28)	93 (28)	83 (25)	83 (25)	77 (23)	90 (27)	519
4607	CLEAR LAKE	0 (0)	10 (3)	0 (0)	0 (0)	100 (30)	0 (0)	110
4608	COCHRANE LAKE	83 (25)	40 (11)	50 (15)	67 (20)	5 (0)	93 (28)	338
4609	COTTONWOOD LAKE	3 (1)	13 (4)	3 (1)	20 (6)	82 (24)	3 (1)	124
4610	DEERFIELD RESERVOIR	90 (27)	88 (26)	97 (29)	97 (29)	5 (0)	53 (16)	430
4611	ENEMY SWIM LAKE	80 (24)	82 (24)	60 (18)	77 (23)	88 (26)	73 (22)	460
4612	LAKE HERMAN	17 (5)	33 (10)	27 (8)	33 (10)	82 (24)	10 (3)	202
4613	ST JOHN LAKE	13 (4)	88 (26)	7 (2)	13 (4)	53 (16)	43 (13)	217
4614	LAKE KAMPESKA	33 (10)	65 (19)	40 (12)	57 (17)	88 (26)	20 (6)	303
4615	MADISON LAKE	27 (8)	77 (23)	53 (16)	53 (16)	13 (4)	30 (9)	253
4616	LAKE MITCHELL	60 (18)	82 (24)	47 (14)	73 (22)	17 (5)	70 (21)	349
4617	LAKE NORDEN	23 (7)	23 (7)	13 (4)	40 (12)	45 (12)	40 (12)	184
4618	OAKWOOD LAKE EAST	53 (16)	17 (5)	20 (6)	17 (5)	45 (12)	85 (25)	237
4619	OAKWOOD LAKE WEST	50 (15)	50 (15)	23 (7)	3 (1)	58 (17)	57 (17)	241
4620	PACTOLA RESERVOIR	100 (30)	98 (29)	100 (30)	100 (30)	35 (10)	97 (29)	530
4621	PICKEREL LAKE	73 (22)	73 (22)	67 (20)	63 (19)	58 (17)	85 (25)	419
4622	LAKE POINSETT	57 (17)	7 (2)	43 (13)	43 (13)	45 (12)	47 (14)	242
4623	LAKE RED IRON SOUTH	77 (23)	58 (17)	80 (24)	87 (26)	93 (28)	78 (23)	473
4624	RICHMOND LAKE	47 (14)	40 (11)	90 (27)	60 (18)	45 (12)	17 (5)	299
4625	ROY LAKE	87 (26)	98 (29)	77 (23)	80 (24)	35 (10)	78 (23)	455
4626	SAND LAKE	7 (2)	58 (17)	33 (10)	30 (9)	23 (7)	7 (2)	158
4627	SHERIDAN LAKE	70 (21)	65 (19)	93 (28)	70 (21)	5 (0)	67 (20)	370
428	STOCKADE LAKE	30 (9)	40 (11)	73 (22)	50 (15)	5 (0)	27 (8)	225

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
4629	LAKE VERMILLION	37 (11)	70 (21)	30 (9)	27 (8)	68 (20)	33 (10)	265
4630	WALL LAKE	43 (13)	27 (8)	63 (19)	37 (11)	97 (29)	37 (11)	304
4631	WAUBAY LAKE NORTH	63 (19)	47 (14)	37 (11)	10 (3)	30 (9)	50 (15)	237

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	4620	PACTOLA RESERVOIR	530
2	4606	CLEAR LAKE	519
3	4623	LAKE RED IRON SOUTH	473
4	4611	ENEMY SWIM LAKE	460
5	4625	ROY LAKE	455
6	4610	DEERFIELD RESERVOIR	430
7	4603	ANGOSTURA RESERVOIR	427
8	4621	PICKEREL LAKE	419
9	4627	SHERIDAN LAKE	370
10	4616	LAKE MITCHELL	349
11	4602	ALVIN LAKE	340
12	4608	COCHRANE LAKE	338
13	4630	WALL LAKE	304
14	4614	LAKE KAMPESKA	303
15	4624	RICHMOND LAKE	299
16	4629	LAKE VERMILLION	265
17	4604	BRANT LAKE	260
18	4615	MADISON LAKE	253
19	4622	LAKE POINSETT	242
20	4619	OAKWOOD LAKE WEST	241
21	4631	WAUBAY LAKE NORTH	237
22	4618	OAKWOOD LAKE EAST	237
23	4628	STOCKADE LAKE	225
24	4613	ST JOHN LAKE	217
25	4612	LAKE HERMAN	202
26	4601	LAKE ALBERT	201
27	4617	LAKE NORDEN	184
28	4626	SAND LAKE	158

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
29	4609	COTTONWOOD LAKE	124
30	4605	LAKE BYRON	123
31	4607	CLEAR LAKE	110

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/11/07

463101
45 23 30.0 096 27 00.0
*AUBAY LAKE NORTH
46037 SO TH DAKOTA

11EPALES
*

2111202
0008 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/25	14	15 0000	10.1		38	2161		374	0.070	2.800	0.080	0.014
	14	15 0005	10.0	9.6		2096		275	0.060	2.900	0.080	0.045
74/07/11	10	05 0000	25.2	3.6	12	3725	9.20	364	0.110	12.400	0.100	0.048
	10	05 0006	25.2	3.8		3454	9.20	378	0.170	10.400	0.210	0.071
74/09/19	13	10 0000	15.2	8.4	30	3003	8.82	580	0.110	4.200	0.030	0.022
	13	10 0005	15.2	8.8		3003	8.83	625	0.110	4.300	0.030	0.048

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/25	14	15 0000	0.092	30.1	
	14	15 0005	0.156		
74/07/11	10	05 0000	0.310	900.4	
	10	05 0006	0.363		
74/09/19	13	10 0000	0.096	42.1	
	13	10 0004			50.0
	13	10 0005	0.158		
	13	10 0007			1.0

STORET RETRIEVAL DATE 75/11/07

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*AUBAY LAKE NORTH
46037 SOUTH DAKOTA

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2111202
0007 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/25	14	30 0000	10.3		33	3460		340	0.120	2.700	0.070	0.010
	14	30 0005	8.2	8.6		3442		174	0.150	2.900	0.120	0.020
74/07/11	10	25 0000	24.7	6.6	24	7165	9.00	455	0.090	3.800	0.140	0.029
	10	25 0005	24.7	6.8		7175	9.00	570	0.060	3.400	0.080	0.041
74/09/19	13	25 0000	15.7	9.0	23	5757	8.80	950	0.050	3.800	0.030	0.015
	13	25 0005	15.8	9.0		5753	8.82	820	0.040	3.300	0.020	0.023

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/25	14	30 0000	0.080	3.9	
	14	30 0005	0.128		
74/07/11	10	25 0000	0.103	67.8	
	10	25 0005	0.126		
74/09/19	13	25 0000	0.069	13.1	
	13	25 0005	0.087		

STORET RETRIEVAL DATE 75/11/07

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45 26 00.0 096 22 30.0
WAUBAY LAKE NORTH
46037 SOUTH DAKOTA

11EPALES
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2111202
0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/25	14 45	0000	10.6		66	4310		370	0.230	3.300	0.100	0.010
	14 45	0005	10.1	10.4		4292		128	0.230	3.300	0.080	0.018
74/07/11	10 45	0000	24.8	7.6	24	7134	8.90	380	0.050	3.900	0.070	0.030
	10 45	0005	24.8	7.6		7134	8.90	520	0.060	4.000	0.090	0.029
74/09/19	13 50	0000	15.2	9.2	24	5587	8.79	880	0.040	3.600	0.020	0.014
	13 50	0005	15.1	9.2		5583	8.83	885	0.040	3.600	0.020	0.024

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/25	14 45	0000	0.053	1.4	
	14 45	0005	0.068		
74/07/11	10 45	0000	0.117	78.3	
	10 45	0005	0.101		
74/09/19	13 50	0000	0.072	6.2	
	13 50	0004			50.0
	13 50	0005	0.081		
	13 50	0008			4.0